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HYPOMAGNESAEMIA IN CATTLE*

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The incidence of hypomagnesaemic tetany in cattle appears to be increasing year by year but whether this is a real increase, or an apparent increase due to better diagnosis, is not known. It is not my intention to deal with hypomagnesaemia in sheep in this paper, but from the evidence available at the Laboratory it appears that the increase in clinical cases of hypomagnesaemic tetany in sheep during the last five years *is* real.

As you know, investigation of the aetiology of hypomagnesaemia has been conducted intermittently at Weybridge over the last 20 years. Before telling you of some of our recent work I would like to outline briefly the history of this condition and refer to some of our earlier work because, on several occasions, it has been suggested that our present findings are irreconcilable with some of our earlier results and that present and previous recommendations are contradictory, a suggestion with which I do not agree.

PATHOGENESIS

There is no need to discuss the clinical symptoms of this disorder since it is so well known to all of you. As you know, there are no specific *post-mortem* lesions and the characteristic abnormality is low blood magnesium.

There is little doubt that the clinical condition of hypomagnesaemic tetany had been known in Europe for a considerable time before detailed observations were commenced by the Dutch workers about 1927 ; they published papers in 1929 and 1930 (Sjollema & Seekles and Sjollema, Seekles & van der Kaay) which definitely associated low serum magnesium values with " grass tetany." English reports of this work were given by Sjollema in 1930 and 1932. The first British work along parallel lines was reported by Dryerre in 1932 ; his observations established pronounced hypomagnesaemia in cases of so-called " lactation tetany" in England. The term " lactation tetany " was introduced by Lothian (1931) who reported the clinical aspects of 21 cases but without correlation with hypomagnesaemia. In 1933 Blakemore & Stewart confirmed hypomagnesaemia, not only in clinical cases of tetany but also in some apparently normal cows of the same herds at the same time. Similar observations of hypomagnesaemia in unaffected cows as well as in clinical cases, were made by Hopkirk, Marshall & Blake (1933) in New Zealand. Although low blood magnesium is the characteristic feature of the condition, in their early investigations Sjollema & Seekles (1930) reported marked hypocalcaemia as well as slightly subnormal calcium. Allcroft (W. M.) & Green (1934) drew attention to the common occurrence of hypocalcaemia with hypomagnesaemia and in 1947 Allcroft (W. M.) showed that in 76 per cent. of 406 cases of hypomagnesaemia there was a concomitant hypocalcaemia. The fall in serum magnesium can be very rapid, occurring within a few days, or may develop slowly over a matter of weeks, or even months, *e.g.*, in beef cattle at grass throughout the winter. Blakemore & Stewart (1934–35) reported a seasonal drop in blood magnesium levels of cows put out to pasture in early spring without any exhibition of clinical symptoms of tetany. Allcroft (W. M.) & Green (1938) and Allcroft (W. M.) (1947) described a regular seasonal variation in serum magnesium over a period of four years in a herd of Hereford cattle at pasture all the year round. Maximum values were found in the summer months and minimum values between December and April, the rate and extent of the rise and fall varying from year to year. A group of 24 Ayrshire cows kept under normal dairy husbandry conditions and housed during the winter did not show any seasonal changes in serum magnesium.

Green (1948) postulated three types of hypomagnesaemia : (1) An acute form in which the fall of blood magnesium is sudden (within a few days or possibly hours), associated with an intense hyperaesthesia which may be followed by convulsive tetany and death. In this type the response to injection of magnesium salts is usually good. (2) A slowly developing seasonal hypomagnesaemia without clinical symptoms, in which blood magnesium falls slowly throughout the autumn and winter to one-half or one-third the normal summer value. The neuromuscular mechanisms of the animal apparently adjust themselves to the gradual change of plasma level and no hyperaesthesia occurs. Injection of magnesium in such cases produces only a temporary response and after 24 hours there is a return to the initial subnormal serum values. (3) In this type the fall in blood magnesium is not so rapid as in the acute type nor so gradual as in the seasonal type and the condition is one of " latent tetany " in which hyperaesthesia can usually be detected by clinical examination. An acute attack may be precipitated by a variety of causes and the effect of an injection of magnesium in these cases is often unpredictable ; serum magnesium values may return to the subnormal pre-injection level in less than 24 hours or it may remain sufficiently near the normal to represent a cure.

In our experience acetonaemia is not often associated with hypomagnesaemia in cattle, but New Zealand workers have reported frequent association of the two conditions in dairy cows and have suggested that they may have a common cause (Swan, 1948).

No other abnormality of the blood other than concomitant hypocalcaemia and acetonaemia has been reported in cases of hypomagnesaemic tetany.

AETIOLOGY

The early reports chiefly associated occurrence of the disorder with the sudden change from winter stall conditions to rapidly growing spring pasture, except in New Zealand, where cows are at grass throughout the year. It is now known that although most common during spring and autumn on a flush-growth of grass and least common during the summer months, the condition can occur at any time in cattle either at grass or stall-fed, and that it is not confined to any particular age, sex or breed, although it is practically unknown in Jersey cattle in the Channel Islands. It does, however,

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occur in Jerseys in England but not as frequently as in other breeds.

Although it is more than 20 years since these first observations were made, the primary cause of the hypomagnesaemia is still not known nor is the nature of the physiological mechanism which controls the level of blood magnesium. Sjollema & Seekles (1933) attempted to correlate the condition with high protein content and later (Seekles & Sjollema (1932) and Sjollema & Seekles (1933)) with a high potassium and nitrate content of the grass, but without success. In 1937 Blakemore, Nicholson & Stewart suggested an association with a high manganese content of pastures ; this has not been confirmed. Most investigators agree that the disorder is not caused by deficiency of magnesium in the nutritional sense since pastures on which it occurs show a magnesium content as high and sometimes higher than pastures on which it does not occur. Green (1948) pointed out that even on soils which respond to magnesium fertiliser treatment, the incidence of hypomagnesaemic tetany appears to be no greater than on soils rich in magnesium. Also, animals are much less prone to hypomagnesaemia when on stall rations of hay and cereals than they are when on grass entirely, even though the former diet provides a lower total daily intake of magnesium than the latter. It is known, too, that hypomagnesaemia may appear and disappear on the same diet within 48 hours. The evidence, so far, indicates that hypomagnesaemic tetany in the bovine—apart perhaps from that which occurs in calves fed mainly on a milk diet—is related to a physiological dysfunction which can be precipitated by a variety of causes, one of the most common being associated with the grazing of rapidly growing grass in spring and autumn. This factor, however, applies chiefly to dairy animals. The incidence in beef cattle, dry cows and young dairy animals appears to be higher during the winter months than during the season of rapid growth of grass. Allcroft (W. M.) (1947) reported a marked association between low serum magnesium values in a herd of out-wintered beef cattle and wet, cold, windy weather ; the serum magnesium change closely followed the rise and fall of temperature. A high incidence of the disorder in beef cows often occurs a few weeks after calving at a time when pasture growth is very low and the plane of nutrition is generally poor. It is under these conditions, especially, that a sudden wet, cold spell of weather may precipitate clinical cases—that is, at a time when the animal is subjected to heavy stresses—lactation, low plane of nutrition and high loss of body heat.

Ender, Halse & Slagsvold (1948) reported hypomagnesaemia in cows on a low energy/normal protein diet and later Breirem, Ender, Halse & Slagsvold (1949) showed that hypomagnesaemia could be induced in lactating cows on a low magnesium/low energy diet, but their results also show that daily intakes of only 9 to 11 g. magnesium per day did not necessarily give rise to hypomagnesaemia. Recent work by Parr & Allcroft (R.) (1953) showed that daily intakes of magnesium as low as 4·7 g. did not produce significant hypomagnesaemia in two-year-old heifers on either high or low energy diets, but these animals were not subjected to the additional strain of lactation.

Although there is no association with soil type, and no correlation between magnesium content of soil or pasture and severity of the disease, the condition does appear to be more prevalent on some farms than on others. The increased incidence is often associated with improvement of grassland and/or an intensive system of ley farming where heavy use is made of artificial fertilisers. Some recent observations on this aspect were made in collaboration with the N.I.R.D. (Bartlett *et al.*, 1954) when the influence of certain fertiliser treatments on the incidence of hypomagnesaemia in milking cows was investigated. The results may be briefly summarised as follows :—

The cows were turned directly from indoor winter feeding to an all-grass diet grown with the following fertiliser treatments.

1952 Plot A—25 cwt .magnesite plus 6 cwt. sulphate of ammonia per acre.
Plot B—6 cwt. sulphate of ammonia per acre.
Plot C—4 cwt. sulphate of potash per acre.

1953 Plot A—no further magnesite but 6 cwt. sulphate of ammonia per acre. ,
Plot B1—6 cwt. sulphate of ammonia per acre.
Plot B2—control—no further dressing.
Plot C—4 cwt. sulphate of potash per acre. In this plot the clover was suppressed with a hormonal spray in 1953.

Of nine cows turned out on plot A (magnesium + nitrogen) in 1952 and 1953, none showed symptoms of grass tetany, and one only showed a substantial drop in serum magnesium levels.

Of 15 cows turned on to Plot B (nitrogen—1952) and Plot B1 (nitrogen—1953), 11 showed severe hypomagnesaemia (at or below 0·6 mg. Mg per 100 ml. serum) and of these, five showed typical symptoms of grass tetany and two others died suddenly. In four other cows, turned on to Plot B (nitrogen—1952) but with supplementary feeding with concentrates, the hypomagnesaemia was much less severe, and no clinical symptoms were observed.

In Plot B2 (control—1953) where no sulphate of ammonia was applied, the serum magnesium level of three cows remained within the normal range, while that of the fourth fell only slightly and there was no evidence of hyperaesthesia.

In Plot C (potash) little hypomagnesaemia appeared in 1952 when the sward contained much clover, but in 1953 the blood magnesium levels dropped in three out of four cases below 1·0 mg. Mg per 100 ml. serum, and clinical symptoms of grass tetany were observed in one animal.

The effect of changing cows from one sward to another was also investigated. In 1952 three cows from plot A (Mg + N) which for 23 days after turning out to grass had shown normal serum magnesium levels, were changed to plot B (N). In two of the animals serum magnesium values fell rapidly while in the other a previous slight downward trend continued. In 1953 five cows from plot A (Mg + N) were transferred to plot B1 (N) at the same time as four cows were changed in the reverse direction. The rapid fall in serum magnesium of all five cows going on to plot B1 (N) and concomitant rapid rise in all four cows going on to plot A (Mg + N) leave no doubt as to the very great difference in the two swards in their effect on the incidence of hypomagnesaemia.

Results of a subsidiary investigation designed to compare the milk production from different grass species, indicated that the occurrence of hypomagnesaemia was not confined to a particular species of grass. Twelve cows were turned on to 12 separate plots, four each of perennial ryegrass and clover, meadow fescue and clover, and cocksfoot and clover. Within seven days typical clinical symptoms of hypomagnesaemic tetany occurred as follows : perennial ryegrass, one case ; meadow fescue and clover, two cases ; cocksfoot and clover, two cases including one death.

These observations do not contribute much evidence regarding the fundamental cause of hypomagnesaemia, but they do indicate that the occurrence of the condition on this farm was associated with the heavy use of sulphate of ammonia. It was not, however, an inevitable outcome of the use of this

fertiliser since, when 6 cwt. were applied to plot A in 1953 following a heavy dressing with magnesium and nitrogen in 1952, little hypomagnesaemia and no clinical cases occurred. The occurrence or absence of hypomagnesaemia on the various plots cannot be correlated with the magnesium contents of the swards. If an average consumption of about 30 lb. dry matter per day is allowed then plot A (Mg + N) would have provided an intake of about 34 g. Mg in 1952 and 47 g. Mg in 1953 ; plots B (N) and C (K) each about 20 g. Mg in 1952 ; plots B1 (N) and B2 (control) each about 23 g. Mg in 1953 and plot C (K) about 19 g. Mg in 1953. It might be argued that a daily intake of over 30 g. Mg on plot A was sufficient to prevent severe hypomagnesaemia and that the cows on plot B in 1952 and plots B1 and C in 1953 were receiving insufficient magnesium. But this would not account for the absence of severe hypomagnesaemia on plot C (K) in 1952 and on plot B2 (control) in 1953 which provided magnesium intakes similar to those on which tetany did occur.

There is the possibility that the beneficial effect of the magnesite dressing on plot A may have been due to an alteration in soil conditions resulting in the absence of " tetany-producing " factors in the herbage, rather than to the increased magnesium content *per se* of the sward.

Although these observations indicate that pastures can become potentially " tetany-prone " after heavy nitrogenous dressings, it is not suggested that this is the only cause of hypomagnesaemia, since it is well known that it can occur under many dissimilar conditions, on old and new pastures of various composition and at various stages of growth and after treatment with a variety of fertilisers. But it is thought that it is worth while to pursue this line of investigation which may provide an indication of one of the " trigger " mechanisms which precipitates the clinical condition and so provide a clue to the physiological mechanism which controls blood magnesium levels.

Treatment

Because of the apparent increase in the number of cases of hypomagnesaemic tetany which relapse after initial response it may be as well to discuss briefly methods of treatment as well as possible methods of prevention.

(*a*) *Parental administration.*—Allcroft (W. M.) (1947) reviewed the literature in his report on the behaviour of calcium and magnesium in the serum of ruminants following administration by various routes. As a result of these experimental trials we have recommended for use by the subcutaneous route two solutions, a 40 per cent. solution of calcium borogluconate and a 50 per cent. solution of magnesium sulphate, both of which are easily made and keep well. Comparison of the intravenous and subcutaneous routes of administration of magnesium sulphate showed that for the same amount injected the latter resulted in a smaller increase but maintained an elevated serum level for a longer time as would be expected. A sufficiently rapid rise in blood magnesium can be got by subcutaneous injection of 200 ml. of 50 per cent. solution of magnesium sulphate (about 4 oz. $Mg\ SO_4 . 7H_2O$) in an adult bovine. This produces a rise in serum magnesium of about 0·5 mg. per cent. in five minutes and the subsequent elevation of serum magnesium does not exceed about 5 mg. per cent., which is a safe level (Allcroft (W. M.), 1947). The use of two solutions, one of calcium and one of magnesium, allows treatment to be varied according to clinical symptoms, but of course magnesium sulphate cannot be used in the same solution as a calcium compound owing to precipitation of calcium sulphate. It is important to emphasise that whether administration is by the subcutaneous or intravenous routes, the solution should always be within a few degrees of body temperature to avoid damage of local tissue and abscess formation.

(*b*) *Oral administration.*—Although hypomagnesaemic conditions are not a result of magnesium deficiency in the nutritional sense there is evidence that prophylactic treatment by " flushing " the animal with readily available magnesium compounds is often successful in preventing a fall in blood magnesium to dangerously low levels during periods when conditions lead to the occurrence of hypomagnesaemia. There is also evidence that adequate oral magnesium supplements can restore low blood magnesium values to the normal range. In 1935 Blakemore & Stewart reported that feeding additional magnesium at the rate of about 31 g. magnesium oxide per head per day had a preventive effect on the occurrence of seasonal hypomagnesaemia, but blood magnesium levels were determined only three times over an experimental period of 41 days.

In 1938 Allcroft (W. M.) & Green reported that feeding a mineral mixture (offered in troughs and not individually) which supplied approximately 45 g. magnesium oxide per head per day appeared to alleviate, to a limited extent, the acuteness of the fall in serum magnesium which occurred between October and December, in a herd of Hereford cattle at pasture all the year round, in which seasonal hypomagnesaemia occurred without clinical symptoms. Later, in a more closely controlled experiment in the same herd, Allcroft (W. M.) (1947) confirmed that the feeding of additional magnesium at the rate of 160 g. magnesium oxide per head per day for the six months November to May, mitigated the fall in serum magnesium but did not keep the level at a normal figure. Results were assessed on the basis of blood samples taken at monthly intervals throughout the experimental period. These observations could be taken as support for the report of Blakemore & Stewart (1935) but reports received from veterinary surgeons over the last 15 years have given conflicting results regarding the value of oral supplements of magnesium-rich minerals, both in the prevention of hypomagnesaemic tetany and as a follow-up treatment to the usual parenteral administration of magnesium sulphate to clinical cases, and it was felt that further controlled work was necessary to investigate this point. When the opportunity occurred it was decided to follow serum magnesium levels at more frequent intervals than had been possible previously, and to drench some cows individually to make sure that they got the specified amount of magnesium oxide (Allcroft (R.), 1953). The experimental procedure was briefly as follows :

The animals used belonged to two dairy herds in which several cases of clinical hypomagnesaemic tetany, some fatal, had occurred.

Early in March in a herd near Wantage, 18 outwintered Shorthorn and South Devon dairy animals were divided into two groups each consisting of three dry cows and six heifers. One group was given access to magnesium oxide at the rate of 2 oz. per head per day mixed with a small amount of crushed oats in troughs in the field, while the second was kept as a control group without magnesium supplements. The animals were run on closely grazed cocksfoot and clover leys which contained an average of 0·20 per cent. MgO on a dry matter basis.

A second investigation on another farm was carried out using 10 lactating Shorthorn and Guernsey cows, paired according to date of calving and milk yield and divided into two equal groups. These animals belonged to the N.I.R.D. herd at Shinfield and observations on them were carried out in collaboration with colleagues at the N.I.R.D. One group of five was drenched daily with 2 oz. magnesium oxide per head after the morning milking for 16 days while still in stalls and subsequently for several weeks while grazing. The other five were kept as controls under similar stall and grazing

conditions. On April 24th all 10 animals were transferred suddenly from stalls where they had been maintained for the winter months on rations consisting of hay, mangolds, silage and concentrates, to a rapidly growing cocksfoot and clover ley as the sole source of food. This was grazed on the strip system controlled by an electric fence. After 31 days the two groups of cows were interchanged so that the controls from then on were drenched daily with 2 oz. magnesium oxide and the previously drenched animals were left untreated as controls. In both investigations blood samples were taken at frequent intervals of a few days during the first two to three months and subsequently at less frequent intervals. The results are shown in Figs. 1 and 2. Magnesium estimations were made on a few pasture samples from the Wantage farm and on a series of samples from the N.I.R.D. farm ; the figures for the latter are given in Fig. 2.

Although there was only a small number of experimental animals on each farm the results show quite definitely that feeding or drenching 2 oz. (approximately 56 g.) of magnesium oxide daily, increased serum magnesium values from subnormal to normal levels and maintained values within the normal range during a period when hypomagnesaemia occurred in untreated controls. They also show that administration of a liberal magnesium supplement to cows with normal blood magnesium levels did not result in an abnormal increase in serum Mg.

It is of particular interest to note that on each farm there was a sharp and rapid fall in serum magnesium levels when administration of magnesium oxide was stopped. This fall occurred in animals on both farms within two days even though 2 oz. magnesium oxide had been given in each case for several weeks previously. The equally rapid rise in serum magnesium following the feeding of magnesium oxide is also noteworthy.

Pasture magnesium figures for samples on the N.I.R.D. farm over a period of eight months commencing in April showed a fall from 0·22 to 0·16 per cent. MgO during the first two weeks' grazing period, followed by a gradual return to 0·22 per cent. during the next two-week period. Subsequently values remained between 0·20 and 0·25 per cent. MgO throughout the following seven months. Even though this slight decrease in pasture magnesium coincided with the fall in blood magnesium in the control group during the first experimental period, it did not persist during the second

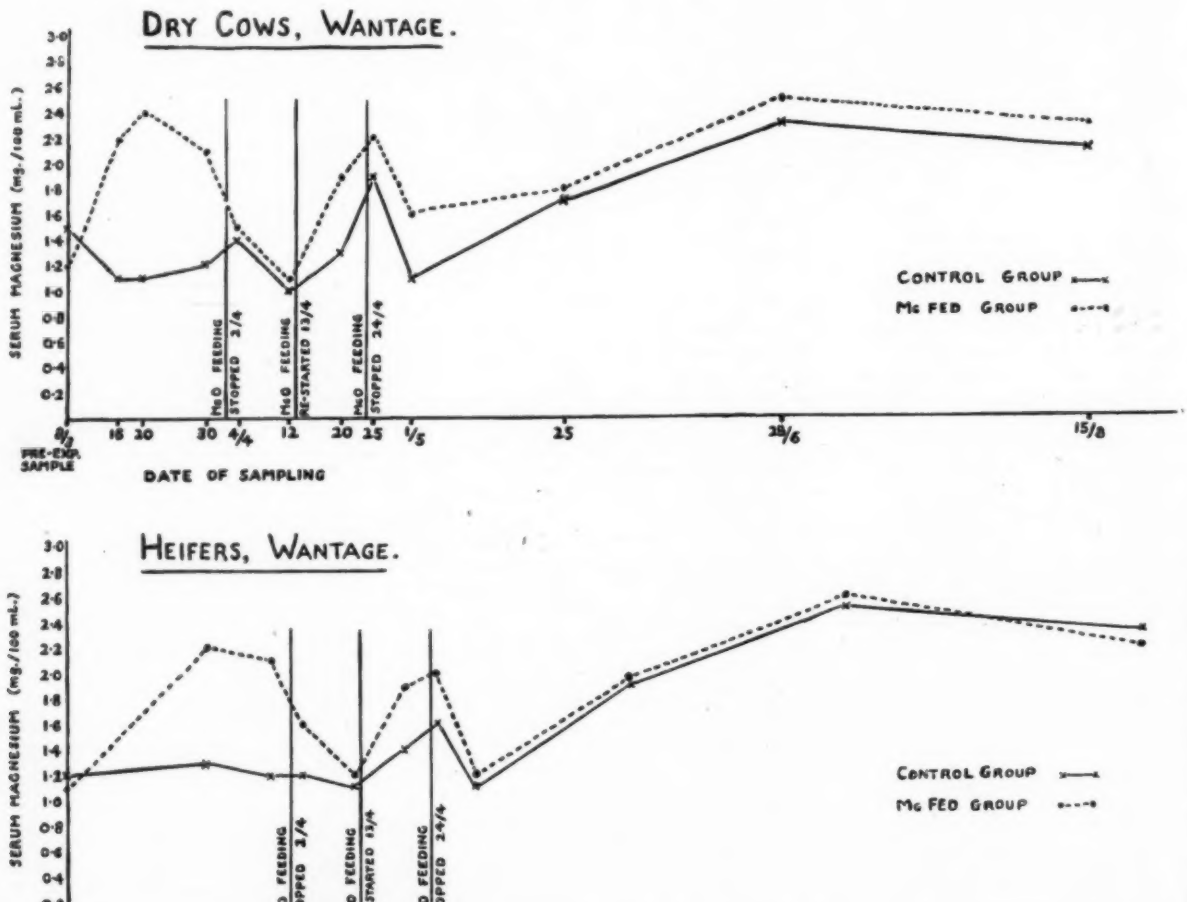

Fig. 1.—Effect of oral supplements of magnesium oxide on serum magnesium values in out-wintered dry cows and heifers.

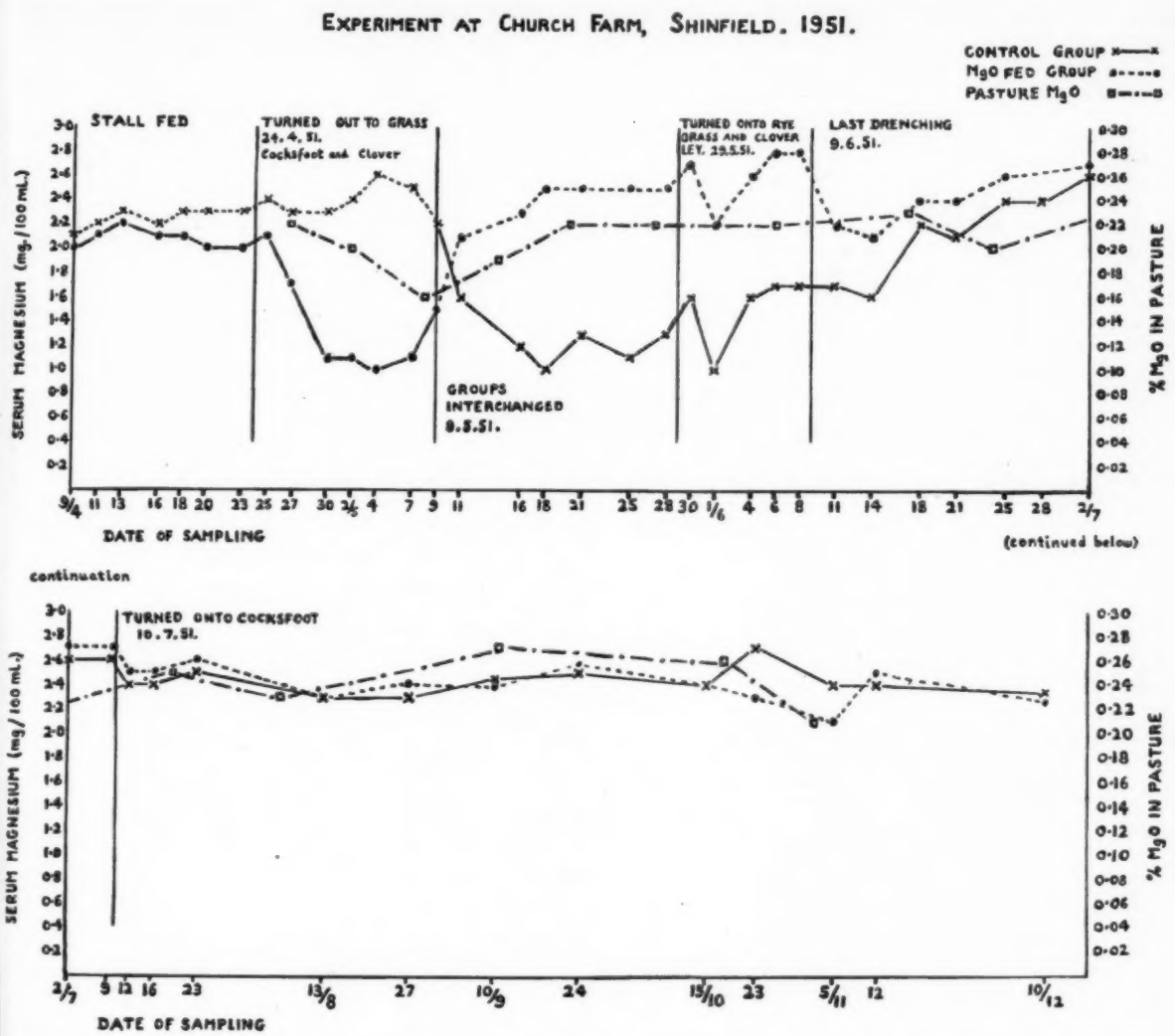

FIG. 2.—Effect of oral supplements of magnesium oxide on serum magnesium values in lactating cows at grass.

period after the treatment of the two groups had been interchanged and when there was as severe a fall in serum magnesium as had occurred previously. For a dry matter intake of 30 lb. per day, pasture with a MgO content of 0·16 per cent. would provide an estimated daily intake of about 15 g. magnesium, which is believed to be adequate. Since all the pasture magnesium figures fell within the accepted normal range there appears to be no question of a deficiency of magnesium in the herbage associated with the occurrence of hypomagnesaemia on both farms.

It is also of interest that serum magnesium values of the control groups rose to normal levels and paralleled those of the magnesium-fed groups towards the end of May on the Vantage farm and about the middle of June on the N.I.R.D. farm. This indicated that at this stage of the grazing season the "susceptible" period, during which hypomagnesaemia was likely to occur, was over. This "susceptible" period operated at different times on the two farms. On the first it occurred from January to March on a closely grazed cocksfoot and clover ley before spring growth had begun; on the second it occurred on a rapidly growing similar ley from April to June. In both herds clinical cases of hypomagnesaemic tetany occurred in control groups receiving no magnesium supplements. Throughout the experimental periods blood calcium values remained within the normal range indicating that the condition in these two instances was uncomplicated by hypocalcaemia.

These results indicate that oral administration of magnesium oxide may be effective in preventing the hypomagnesaemia that frequently occurs in cattle of various ages (beef cattle and dry cows as well as milking cows) usually when grazing during the winter months or on rapidly growing pasture in spring and autumn. However, in a later controlled experiment on a third farm for which complete records are not available, oral daily supplements of 2 oz. of calcined magnesite containing about 90 per cent. magnesium oxide failed to maintain normal serum magnesium levels in a group of 10 milking cows turned out gradually from stalls to a rapidly growing pasture heavily top-dressed previously with a nitrogenous fertiliser. Low serum magnesium values occurred in five of the 10 experimental animals during the first two weeks at grass and several other clinical cases of hypomagnesaemic

tetany occurred in the rest of the herd which were also receiving 2 oz. of calcined magnesite daily. The possibility that these animals did not eat their daily magnesium supplements was checked and ruled out. No explanation can be offered for these conflicting results, but it is perhaps possible that insufficient calcined magnesite was given to counteract the tetany-producing factors in the pasture in this case. The supplement of 2 oz. was an arbitrary amount and it has not yet been possible to investigate minimum effective doses under varying conditions.

These observations indicate that it is necessary to maintain a continuous "flushing" of the animal with magnesium in order to prevent hypomagnesaemia during "susceptible" periods for the particular herd. Taken in conjunction with the failure of oral magnesium supplements to maintain normal serum magnesium values in cows on the third farm, these results offer an explanation for conflicting reports regarding the value of magnesium-rich mineral supplements for the treatment of hypomagnesaemia. They also indicate that if, for any reason, an animal does not take sufficient supplementary magnesium during a "susceptible phase" it may become a clinical case even though it has been fed magnesium-rich supplements for a considerable time previously.

It has been suggested that Weybridge workers have in the past advised against the use of magnesium-rich supplements for prevention of hypomagnesaemia, and that these present results conflict with our earlier ones. I do not think that is so. And you will agree, I am sure, that there can be no progress without constant revision and reinterpretation of observations resulting in a shift of emphasis from time to time on recommendations. Until we obtained the results of the experiments described above we stated that we had no evidence that a magnesium-rich supplement was effective in preventing hypomagnesaemic tetany, but on the other hand our evidence was not sufficient to deny that it might be of assistance in some cases and we recommended that it should be tried. Now we strongly advise the use of oral supplements of calcined magnesite, which is a relatively cheap commercial product containing not less than 87 per cent. magnesium oxide, as a prophylactic and as a follow-up to the usual parenteral treatment of clinical cases.

We are carrying out investigations on the production of tetany in calves but certain aspects of this condition differ considerably from those in the more mature animal and it would be better to leave this problem over for another discussion.

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INFECTIOUS KERATO-CONJUNCTIVITIS OF CATTLE (NEW FOREST DISEASE)*

BY

C. FORMSTON

Introduction

Bovine infectious keratitis, or kerato-conjunctivitis, affects cattle of all ages. It is widespread in America and there is reason to believe that its incidence is on the increase in this country. It has been recorded in India, Mitter (1915); South Africa, Coles (1936); Holland, Poels (1911), and Canada, Allen (1919). A review of the literature affords ample evidence that the disease is highly contagious and most American workers are of the opinion that the causal agent is *Moraxella* (*Haemophilus*) *bovis*.

Jones & Little (1923) recovered a gram-negative diplobacillus from cases of "Infectious Ophthalmia" and with cultures of the organism transmitted the disease to healthy cattle. Later this organism was identified as *H. bovis*.

Baldwin (1945) recovered *H. bovis* from 93 of 112 infected eyes and reproduced a keratitis clinically indistinguishable from the naturally occurring disease in one or both eyes of 12 out of 15 calves by introducing cultures of *H. bovis* into the conjunctival sac. He was unable to recover the organism from the eyes of 20 normal cattle. Barner (1952) isolated *H. bovis* from 92 of 95 cattle affected with keratitis and typical lesions were produced in four calves when a culture was instilled into the conjunctival sac. Farley *et al.* (1950) isolated *H. bovis* from field cases, but cultures failed to reproduce the disease in five young calves.

Jackson (1953) had no difficulty in finding *H. bovis* in infected eyes in every outbreak he observed. Conjunctival inoculation of pure cultures produced typical symptoms in 58 cattle including 10 calves, four sheep and one goat, but repeated inoculations failed to infect four adult cows. Baldwin, Farley & Barner found that sheep were not susceptible to conjunctival inoculation of either virulent eye secretions from infected cattle or cultures of *H. bovis*.

Until recently serious outbreaks have not been encountered in this country. One of the earliest records is by Penberthy (1897) who observed four outbreaks mainly in young cattle. Brown (1934) gave a detailed account of several outbreaks of "Contagious Ophthalmia" and furnished ample clinical evidence of its contagion. Craig & Ratter (1940) described contagious keratitis in a herd of 50 cows and 20 heifers. Eight animals became affected, but the transference of infective material failed to produce the disease in normal animals.

The first mention of *Moraxella* (*Haemophilus*) *bovis* as the possible aetiological agent was made by Watt (1951) who encountered keratitis in dairy cattle in Scotland. He isolated *H. bovis* but attempts at transmitting the disease were unsuccessful.

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Following the communication of Watt, Pook (1951) recorded an infectious conjunctivitis of six-month-old calves and " Inclusion bodies were seen in many of the epithelial cells " from conjunctival scrapings. This coincided with the findings of Blakemore (1947). More evidence of its increasing prevalence in this country came from Hall-Patch (1951) who described keratitis as widespread in cattle in the New Forest area during the summer of 1951 ; the outbreaks were thought to be of rickettsial origin.

Mitchell & Hughes (1953) appear to be the only writers who have associated parasites with bovine keratitis. They examined 50 cattle from three months to six years on different farms in three counties. All showed varying stages of keratitis and " at any time during the course of the disease a nematode worm may be seen moving across the cornea or conjunctiva." The parasite was identified as of the genus Thelazia.

During 1952 and 1953 the author encountered five outbreaks of the disease.

Outbreak No. 1

This was in a herd of about 400 Devon cattle of all ages in Hampshire and on June 14th, 1952, 25 heifers or cows and eight calves were affected, the majority unilaterally but some bilaterally. All the cattle were at pasture and the first case had appeared a month previously ; varying stages of the disease were observed and affected animals were tormented by flies. The weather was warm and humid.

The farm was revisited on August 18th and this time 137 animals had had keratitis ; 28 three-month-old calves (six bilateral), 31 two-year-old heifers (four bilateral), 17 nurse cows (one bilateral), two house cows and one bull. There were two cases of corneal perforation in the calves. In bilateral cases there was often a delay of weeks before symptoms appeared in the second eye. A number of animals had had as many as three attacks in the same eye.

No cases were seen in animals grazing the same pastures during 1953, but several heifers grazing on land some distance from the farm contracted the infection.

Outbreak No. 2

This was in Surrey in a group of 18 six- to nine-month-old Shorthorn and Shorthorn × Aberdeen Angus heifers. On the day of examination, August 11th, 1952, 10 were affected including two bilateral cases, both with a severe keratitis and blind. The disease had been in existence about a week. It was the custom on this farm to allow these animals to graze by day and to house them at night. This was the only visit made to this farm, but the writer was informed that not one of the heifers escaped infection ; a similar outbreak occurred during the summer of 1953.

Outbreak No. 3

This was on a farm in Berkshire. A mixed batch of cross-bred Shorthorn steers and heifers varying in age from four months to three years were at grass and under daily observation. One or two animals had eye symptoms one week before examination. The owner thought the eyes had been damaged by the cattle pushing their way through fences but when the incidence increased he sought veterinary advice.

On September 17th, 1952, when the farm was visited, examination of a number of animals suggested that the disease had existed for longer than one week. A six-month-old heifer, a two-year-old steer, and a heifer just under two years possessed corneal lesions of some standing. This last animal was blind and was admitted to the College hospital. A fuller description of this case is given elsewhere in this paper. Others showed small non-stainable opacities on some part of the cornea indicating recovery or aborted attacks. One or two were in the initial stages with localised corneal opacities positive to stain.

A second visit was made on October 3rd, 1952, after affected animals had been treated. Several, which had normal eyes at the time of the first visit, now had one, two or three small opacities of the cornea—negative to stain, or had added to a previous opacity by one or two spots at other parts of the cornea—all negative to stain.

Outbreak No. 4

This was in a self-contained herd of Shorthorn cows, weaned calves and yearlings, on the Hampshire-Berkshire border. When first visited on June 15th, 1953, 18 milking cows (three bilateral) and 15 calves (seven bilateral) four to six months old were affected at varying stages. The disease first appeared in a heifer a month previous. Injury was thought responsible and little attention was given to the case until a number of animals were noticed with similar symptoms two weeks later. At the time of the first visit fresh cases were appearing daily and within a few days several yearling heifers became infected although they were grazing some distance from the cows and did not mix with the calves.

During the period which elapsed between the first and second visits (August 28th, 1953) periodical telephone conversations were held with the owner who was worried because of continuing fresh cases and recurrences in cattle which had been treated and apparently recovered.

On August 28th, 40 (10 bilateral) of 70 milking cows were in the throes of the disease or had had it, 20 of 40 calves were involved and 15 yearlings (12 bilateral) out of 40 exhibited eye lesions.

At this time the disease was on the wane, and symptoms in fresh cases with or without treatment tended to subside fairly quickly with little corneal change.

The 15 yearlings—some of them were obviously more than a year old—were examined individually. One heifer which was supposed to have " had it badly " three weeks previous had a clear cornea in each eye. The same was found in two other heifers ; in one symptoms had abated within two days of onset, the other had been attacked twice in one eye and three times in the other. Nine had localised degrees of opacity in both eyes varying from an opalescent spot negative to stain, to yellowish-white areas roughly a quarter of an inch in diameter which were positive to fluorescin. Evidence of corneal vascularisation could be detected in all those which were positive to stain.

Outbreak No. 5

This was on a farm in Middlesex towards the end of August, 1953. It was a mixed herd of steers, heifers, calves and nurse cows numbering 37 in all, Shorthorn in type and at grass. The first case had been noticed 10 days earlier and was quickly followed by others. The owner thought that boys had caused the eye lesions by shooting at the cattle with air rifles ; a friend of his was encountering a similar condition among his cattle several miles away. On the day of the visit approximately half the herd were affected in one or both eyes and the disease had been in existence on the farm for some time. A number of eyes were in the recovery stage, some had had a recent attack and several animals had severe bilateral keratitis and were blind.

Symptoms and Course of the Disease

These outbreaks were seen in consultation with, and by the courtesy of, practising veterinary surgeons and all stages of the infection were seen. The earliest symptoms are profuse

Fig. 1.—Initial corneal lesion at junction of lower lid and third eyelid. Note oedema of upper and third eyelids and conjunctival congestion.

Fig. 2.—Complete corneal opacity with circum-corneal vascularisation. Bilateral. Animal blind.

lachrymation, blepharospasm and photophobia. Examination reveals oedema of the eyelids and congestion of the conjunctival vessels particularly those of the bulbar conjunctiva. No corneal lesion can be detected with the naked eye at this time and the absence of staining following the introduction of fluorescin solution indicates an intact corneal epithelium. After 48 hours the same eye will exhibit at about the centre of the cornea a faint white spot approximately 3 mm. in diameter which can be stained only very faintly with fluorescin. The position of this primary lesion is not constant and may appear anywhere on the cornea. Within the next 24 to 48 hours this small opaque area may, in the untreated eye, be slightly raised from the rest of the cornea, or there may be a shallow facet-like ulcer. Ulceration usually involves the corneal epithelium and the subjacent Bowman's membrane only and it stains with fluorescin solution. A haze surrounds the stained area and the iris and anterior chamber may be examined at this stage. There is usually no evidence of an iritis, the pupil is not constricted and the anterior chamber is free from exudate. Intraocular tension is normal or slightly raised. During the next few days there is complete corneal opacity and the area which can be stained is larger. This opacity varies from a pale yellowish white to a deep creamy yellow and the animal is blind. At the same time, there is a marked circumcorneal congestion of the conjunctival vessels with the commencement of a uniform vascularisation of the cornea. The eye is painful and lachrymation is still excessive and may be mucopurulent, with matting of the eyelashes. Adventitious vascularisation of the cornea proceeds rapidly towards the primary lesion. An oval light yellow area involving the centre of cornea with an outer darker coloured yellowish zone and the rest of the cornea a red mass of capillary loops is a typical picture of the keratitis at the seventh to ninth day. As the repair process continues, pain, blepharospasm and lachrymation subside, but manual interference is resented. As vascularisation reaches the centre of the cornea there is a tendency for the corneal opacity to clear from the periphery inwards. This coincides with the disappearance of many of the capillary loops and the final rôle taken on by individual branches, particularly those from the corneoscleral junction nearest to the original lesion. Leucocytic infiltration becomes localised to the centre of the cornea which persists until epithelial repair is complete. Recovery is usual within three to five weeks. A faint localised opacity may remain.

Destructive changes may be more severe in young cattle with a longer period of repair. The characteristic feature is an extensive ulceration of one or both eyes involving the substantia propria. The usual symptoms are exhibited but it is marked by its rapid progress. Within five days of the onset of symptoms an oval-shaped ulcer, half an inch or more in length with raised callused edges, occupies approximately the centre of the cornea. Extensive corneal vascularisation embraces the ulcer margin imparting to it a reddish yellow colour. The rest of the ulcer is yellowish ostensibly due to the heavy concentration of leucocytes. It stains deeply with fluorescin. Very quickly the ulcer fills to the level of its margin and becomes narrower. The lesion is often thought to be an anterior staphyloma. Corneal perforation does not occur. At about 10 days the cornea is less vascular but still opaque. A yellowish protrusion of half an inch in length, a quarter of an inch wide and a quarter of an inch deep is apparent and this reduces in size until it becomes level with the cornea leaving a yellowish white scar surrounded by a diffuse haziness ; covered by epithelium but still invaded by a number of vessels approaching from its ventral aspect. The corneal opacity clears and after a period of blindness vision improves although some keratoconus is obvious in most. Many ulceration cases pass through a chronic phase of gradual return to normal corneal transparency and most retain a permanent scar.

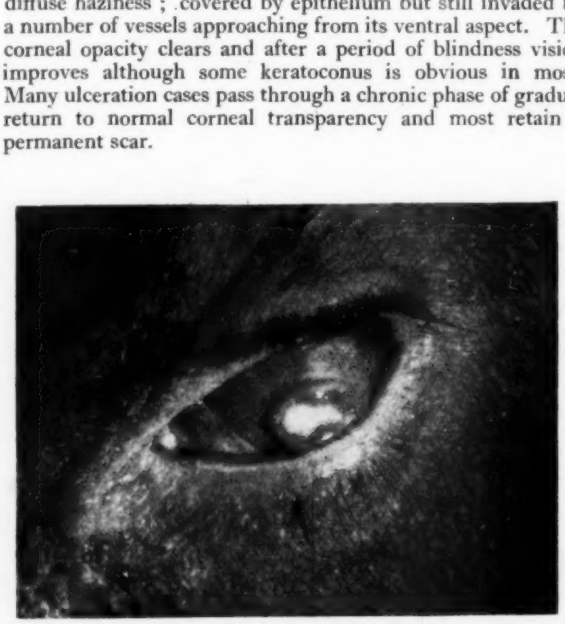

Fig. 3.—Corneal ulcer with calloused margins.

Fig. 4.—A keratocoele in a three-month-old calf.

Fig. 5.—A localised keratitis—later stage of healing.

A 20-month-old cross-bred Shorthorn heifer was admitted to the College on September 17th, 1952, with a bilateral diffuse greyish-white corneal opacity. There was a narrow dense band of corneal vascularisation at the corneoscleral margin and the individual vessels passed to a central yellow protrusion ; the animal was blind. Both eyes followed a similar course and on September 25th the cornea was a bluish-grey hue. The circum-corneal vascularisation at the limbus was much the same but vessels to the central yellow-protrusion—by this time much smaller—were approaching from the ventral aspect. The animal could now see a little and further visionary improvement was apparent by October 3rd. The central lesion was yellowish white and level with the corneal surface, except in so far as there was a definite keratoconus, and was still in receipt of an active blood supply. The rest of the cornea apart from a slight haziness around the central lesion was clear enough to enable part of the pupillary aperture to be seen under focal illumination. Numerous ghost-vessels could be seen traversing the cornea when examined with a binocular loupe. Despite the gradual increasing transparency of the cornea over the ensuing weeks this animal never quite recovered normal vision up to the time of slaughter on December 2nd, 1953. The reason for this was discovered on *post-mortem* examination ; the anterior chamber of each eye was occupied in part by an irregular shaped plaque of leucocytes and fibrin which tended to obscure the pupillary opening particularly when constricted.

Fig. 6.—Keratoconus following a keratitis of three months duration.

Hypopyon is frequently seen as a local manifestation of systemic disease in young calves and disappears within two to five days. Usually it consists almost entirely of leucocytes, whereas in the present instance it consisted of leucocytes imprisoned on a fibrinous network and, therefore, less readily absorbed.

In some cases, especially in cattle over one year of age, the disease runs a much shorter course and corneal changes are less severe. The initial lesion is the same but at no time is corneal ulceration obvious. Erosion of epithelium has obviously occurred because the area of about 5 mm. in diameter is positive to stain. Leucocytic infiltration is much less pronounced and whilst the central lesion is yellowish white in colour the rest of the cornea varies from a surrounding zone of cloudiness to a diffuse white opacity thinning towards the limbus. There is freedom from pain in five to seven days and resolution is accomplished by epithelial cells and limited vascular assistance. Corneal opacity clears rapidly until only a small yellowish white opacity remains, often surrounded by a narrow white ring. Approximately 14 days from the onset of symptoms there remains an opalescent scar negative to stain.

Young cattle are affected more severely than adults and perforation of the cornea may occur.

One interesting case of ulceration was observed in a three-month-old calf which had apparently contracted the infection from a nurse cow. Both eyes had a circular ulcer about a quarter of an inch in diameter through which Descemet's membrane protruded as a transparent vesicle—a typical keratocele. This vesicle did not involve the whole floor of the ulcer which was faintly opaque. The ulcer margin was thickened and raised about the surface of the cornea. There was no sign of pain or of lachrymation. The bulbar conjunctiva appeared normal and apart from a few isolated capillary vessels approaching the ulcer from the dorsal aspect the cornea was transparent. The anterior chamber was normal ; the pupil showed some constriction and intraocular tension was slightly raised. A very narrow ring surrounding the base of the vesicle could be stained. According to information received some weeks later, the eyes did not rupture and had " healed."

Treatment

Collyria, irrespective of ingredients, are unsatisfactory. Acute blepharospasm makes for difficulty in the introduction

Fig. 7.—Bilateral keratitis, three months duration, vision poor.

of any solution and its therapeutic value must be very transient. Time is saved if affected animals pass through a crush and both eyes may be examined. The stage of an eye lesion cannot satisfactorily be determined without staining the cornea with a 2 per cent. fluorescin solution. Almost any preparation will control the progress of the disease in the early stages, but those which can be introduced in an oily or soft ointment base are most satisfactory both from ease of introduction and duration of effect. Such preparations have a mechanical soothing value. It is essential that treatment be instituted early if a progressive keratitis is to be avoided, and in this respect most of the antibiotics are efficacious. Following its recommendation by Hall Patch, chloromycetin 0·5 per cent. ointment was found to be as efficacious as described. Intramammary penicillin, because of its ready availability, has also been prescribed with similar results. Barner tested the sensitivity of *H. bovis* to various antibiotics *in vitro*, and found that the larger zones of growth inhibition were produced by chloramphenicol and penicillin. Chloramphenicol ointment 0·1 per cent. under the trade name "Alficetyn," was used in the later outbreaks and was extremely satisfactory. As far as possible, particularly in sunny weather it is advisable to keep affected animals housed otherwise they seek the protection of shade and are perpetually pestered by flies. Early treatment almost invariably means a return to normality within a few days. In cases where there is corneal change, to the exclusion of mass adventitious vascular invasion, treatment is indicated and can be expected to have desired results. Severe ulceration with an existent vascular keratitis, irrespective of treatment, cannot be dissuaded from passing through a protracted process of repair. A bland preparation probably gives comfort but does little to expedite recovery. During the final stages of corneal repair when epithelisation is almost complete, treatment is of no value and is often disconcerting to the patient.

Discussion

Recent contributions suggest that bovine kerato-conjunctivitis is becoming more prevalent in this country. This is supported by clinical contact with the disease during the past two years and by private communications from veterinary surgeons in various parts of the country. It may give serious concern to the cattle industry and young cattle experience a check in growth and weight gain. The disease is a seasonable one ; the majority of cases arise during the summer months. Towards autumn attacks are milder and in many instances transient. A mild warm autumn may produce an outbreak which may spread and extend well into the winter if cattle are housed and in close proximity to each other. It appears that *Moraxella* (*H.*) *bovis* is responsible and that the disease in cattle is different from that which occurs in sheep. Conjunctival swabs and scrapings were taken from all the outbreaks herewith described and no bacteria recovered, organisms morphologically similar to *H. bovis* were seen in smears in one instance but attempts to culture this organism failed. Hawksley (1954), however, attended seven outbreaks during 1953 and succeeded in culturing *H. bovis* in the majority of affected animals from which eye material was taken. There is no doubt that many recovered cattle become carriers of the organism. According to Barner (1952) affected animals may harbour *H. bovis* for a year or longer. There is no indisputable evidence that flies are transmission agents but there are grounds for supposing that flies and bright sunlight are excitant factors. Washings from the conjunctival sac of infected animals are often brown in colour, presumably from dust and dirt introduced into the eyes by the hind feet when brushing off flies. Clinical findings suggest that animals which have passed through all phases of the disease acquire some immunity. Those which have had a transient attack are prone to subsequent attacks. Jackson (1953) found that serum from experimentally infected cattle gave an antibody titre of 1 : 320 after the 14th to 20th day. Non-milch animals at pasture should be under regular observation and any sign of eye symptoms should be regarded as a potential herd problem. Once the disease is present in a herd regular inspection of all its members is essential if the clinical features are to be kept within bounds. Early treatment, irrespective of the medicament employed, tends to cut short the course of the disease, but once a well-established vascularised keratitis

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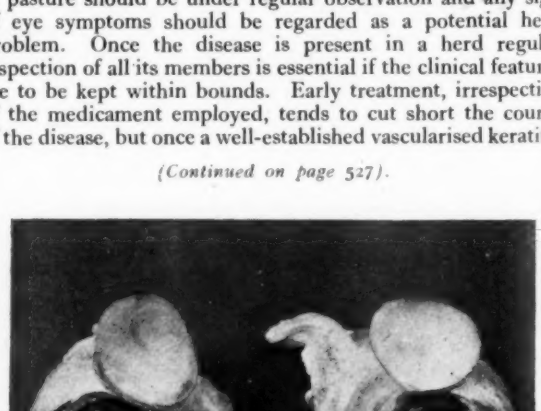

Fig. 8.—Eyes from patient figured in 7. Hypopyon exudate present in one eye, but has been removed from the other.

Photographs 6, 7, 8 refer to the heifer mentioned in the text.

THE TENTH WORLD POULTRY CONGRESS

We are indebted to a special correspondent for the following review of the Tenth World Poultry Congress held recently in Edinburgh.

Once again the city of Edinburgh emphasised its attractions as a Congress Centre, when more than 2,000 delegates attended the Tenth World's Poultry Congress which was held there from August 13th to 21st.

Sixty-seven nations participated. Delegates were drawn from all parts of the world including the U.S.S.R., Czechoslovakia and Poland. A very large number of veterinarians attended from this country and overseas; Dr. W. R. Wooldridge, President of the Royal College of Veterinary Surgeons, and Sir Thomas Dalling, Past-President, were present.

The Congress was notable for the enthusiasm of its members at all functions whether educational or recreational. The McEwan Hall was filled to near capacity when the Congress was officially opened by H.R.H. The Princess Alice, Countess of Athlone, and the high level of this ceremony was maintained throughout the entire period of the Congress which was considered to be one of the best yet held. Great credit is due to the organisers, the Department of Agriculture for Scotland.

The speakers at the opening plenary session, which also was held in the McEwan Hall, were Sir Patrick Laird, former Secretary of the Department of Agriculture for Scotland, and President of the Congress; Professor Lerner, University of California, Dr. Jukes, Lederle Laboratories Division, New York, and Mr. J. E. Wilson, of the Ministry of Agriculture and Fisheries, Lasswade.

Professor Lerner, in a brilliant and stimulating paper, stressed that the fundamental purpose in poultry improvement is to produce the best genotype for a given environment and at the same time to establish the optimum environment for the genotypes created. The conception of the genotype has been modified and the realisation of the importance of populations and not individuals has led to a major revolution in breeding practice. He discussed levels of homozygosity, the bases of non-additive gene action and other aspects of population genetics such as artificial induction of new genetic variability or the uncovering of existing variations by environmental shocks.

Dr. Jukes dealt chiefly with the nutritional effects produced by antibiotics in the diet of chickens and pointed out that it was unsafe to postulate that these are due to any other cause than their effects upon the intestinal bacteria. He also covered some of the most modern developments in unidentified vitamins, aminoacids and the new methylating agents, and gave some striking instances of the influence of progressive changes in the basic diet on the growth rate of chicks.

Mr. Wilson discussed the present position of the more important diseases and outstanding developments since the last Congress in Paris in 1951, chief attention being paid to fowl paralysis, Newcastle disease and respiratory diseases. He mentioned the use of "dust vaccines" for Newcastle disease and the recent production of a vaccine for administration in the drinking water. The effectiveness of control of movement of stock in reducing the number of outbreaks in Great Britain was stressed. The importation of live poultry, hatching eggs and day-old chicks into Scotland from any other part of Great Britain was banned in December, 1950. There had been no outbreaks during the past three years. He warned against the growing tendency to consider medicaments of one sort or another as essential components of the normal diet and the conception of drug and vaccine therapy as substitutes for good hygiene, husbandry and nutrition.

The Papers

Papers were presented in five sections—(A) Genetics and breeding, (B) Physiology and nutrition, (C) Diseases and their control, (D) Economics and marketing, (E) Husbandry and miscellaneous—meeting in adjacent lecture rooms in the Old University Buildings, South Bridge.

It was particularly gratifying that, of the 111 papers accepted, the authors of 82 were present to speak to their papers. The time permitted for this purpose was limited to 5 to 10 minutes to allow for discussion. Sessions commenced promptly at 9 a.m. and were run to a strict time-table so that members could plan their attendance at the various sections with the assurance that they would hear the papers selected—an aspect which has tended to be overlooked at previous congresses.

All rooms were filled to capacity. In Section C more than 350 people were present in the lecture room and it was necessary to relay the proceedings to an adjacent hall; such attendances were maintained throughout the week.

In Section A interesting papers on the origin of various breeds of poultry, and on population, physiological and developmental genetics were featured. The papers which had

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has developed any form of treatment is merely palliative. At the present stage of knowledge it is vital that we recognise its existence, stress the importance of its early recognition and control its development and severity by speedy application of therapeutic measures.

Summary

The clinical features of kerato conjunctivitis in cattle are described, based mainly on five major outbreaks of the disease.

The disease appears to be most active during the summer months, particularly if the weather is warm and humid.

It is highly infectious and readily spreads if cattle are in direct contact.

It attacks cattle of all ages, but symptoms are more severe in young stock.

Most forms of treatment, particularly the antibiotics will control the keratitis if applied early.

Acknowledgments.—I wish to thank those veterinary surgeons by the courtesy of whom the outbreaks were investigated. I would thank also my colleagues, Mr. P. Ingram and Mr. M. B. Hawksley for carrying out the bacteriological examinations of eye material. I am indebted to my former colleague, Mr. E. J. Roberts, for the photographs and to Mr. P. Henfrey for technical assistance. I am also grateful to Mr. Bruce Jones, of Messrs. Allen & Hanbury, who kindly supplied the "Alficetyn" eye ointment.

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the widest general appeal to members were those dealing with the practical application of genetic principles.

In Section B a wide range of problems in physiology and nutrition were dealt with. One group of papers described improvements in methods of evaluating basic feeding stuffs and mixed rations. Others dealt with the nutritional characteristics of protein concentrates. The depressant effect on hatchability of a fish meal supplement to the all-cereal ration of breeding flocks was described. Work on vitamins was reported, together with the rôle of intestinal micro-organisms, studies of energy metabolism, and the regulation of body heat and filter-paper electrophoresis.

In Section C it was evident that fowl paralysis evoked the greatest response and it was necessary to arrange an additional meeting to enable further discussion to take place. The value of inherited resistance to the disease and the success of isolation as a practicable means of prevention were stressed. Strong evidence was produced that the visceral type of the disease, at least, may be egg transmitted. Great interest was shown in papers on chronic respiratory disease, infectious coryza and infectious laryngo tracheitis, the spray method of vaccination against Newcastle disease, the use of Furazolidone in fowl typhoid, and in the prevention of salmonellosis by fumigation with formaldehyde. There was general regret that longer discussions on such subjects as sulphonamide poisoning, haemorrhagic disease and the parasitic population associated with deep litter were not possible.

Marketing and Economics

Though the number of papers read in Section D was smaller, keen discussions took place. Six of the nine papers dealt with various aspects of marketing eggs, poultry meat, broilers and turkeys, and another described the large-scale shipment of baby chicks by air—a recent development of international interest.

The American speakers pointed out that the high level of consumption of poultry meat had been achieved despite competition from other meats such as beef and pork, and stressed the trend towards increasing commercialisation and specialisation in the American industry. It was reported, for instance, that there was practically no farm hatching of birds for broiler production, all being supplied by specialised hatcheries.

A number of factors account for the rapid development of the poultry meat industry in the United States—the high average standard of living and the high level of a consumer's purchasing power which are reflected in the great demand for all livestock products. The demand for poultry meat has been stimulated by carefully organised sale campaigns, such as the "Eat More Turkey" campaign; innovations in production methods, particularly in feeding and management, have enabled the industry to compete on a sound economic basis with other livestock products, and an important element in the development of the industry has been the institution of broiler financing. A large part of this finance is provided by feed companies who not only provide capital but also supervision and advice on management.

Some European speakers were inclined to doubt whether such intensive methods of poultry meat production were possible in Europe. The question was raised of the increased risk of disease in these very large flocks with the possibility of large-scale capital losses. To some extent the risk of losses is met by the methods of broiler financing which protect the farmer against out-of-pocket losses while the financier is able to meet such losses from gains from other flocks in which he is interested.

In Section E it was perhaps regrettable that there was an almost complete absence of papers on husbandry. The poultry industry in several countries was described, and the progress achieved in some where formerly poultry-keeping was not well developed was perhaps surprising.

The problem of preserving the quality of shell eggs was discussed in several papers and the harm done by washing and subsequent mishandling of eggs was emphasised. There was general agreement that washing of eggs should be discouraged and that methods of production which ensure the preservation of cleanliness should be the policy of the advisory services.

At the closing plenary session the chairman of each section reviewed the work of the sessions.

It is obvious that at future congresses still more time must be made available for discussion and consideration must be given to a departure from the form of the Congress which has become almost traditional and either an encroachment made on the time reserved for afternoon visits, or the institution of symposia on important topics.

Exhibitions and Films

In addition to the plenary and sectional papers, a scientific exhibit was staged in the Royal Scottish Museum illustrating work on poultry carried on by the three Scottish Agricultural Colleges, the Poultry Research Centre, the Rowett Research Centre, the Royal (Dick) School of Veterinary Studies and the Veterinary Laboratory of the Ministry of Agriculture and Fisheries at Lasswade. This attracted more than 10,000 visitors during the week.

A popular exhibition of live poultry, methods of poultry husbandry, incubation, brooding and other commercial aspects of the industry was staged in the Waverley Market and was visited by over 26,000 persons.

On two afternoons there were film sessions at which films from this country and overseas were shown; these attracted large audiences.

A large and varied programme of tours and visits was carried out; more than 170 people visited the Ministry's Laboratory at Lasswade.

The lighter side of the Congress was not neglected. All delegates and members were invited to an official reception in Scotland's historic Parliament House, and leading members of delegations and other eminent persons were guests of Her Majesty's Government at dinner on Monday, August 16th, when the remaining members were guests at an ice show. The Corporation of the City of Edinburgh held a garden party at Lauriston Castle in honour of members of the congress, and on Wednesday, August 18th, a "Scottish Evening" was arranged in the Congress Club with demonstrations of Highland and country dancing and a cabaret. On the Friday evening members were invited to Edinburgh Castle to attend a preview of the Military Tattoo which forms part of the annual Edinburgh Festival.

One of the most successful innovations was the provision of a Congress Club, in the Assembly Rooms, where delegates could meet and dine and wine in comfort, and where all the usual facilities of a club were provided. The close situation of the Club, the Exhibition, the Museum, the McEwan Hall and the Old University, contributed greatly to the pleasure and comfort of the entire congress.

The congress closed as it started, with a simple dignified ceremony in the McEwan Hall. After resolutions of thanks had been proposed, the proceedings ended with the singing of "Will ye no come back again" and "By Cool Siloam" by the Kirkintilloch Junior Choir. The beautiful rendering by the children in the cathedral-like atmosphere of the lofty McEwan Hall was an unforgettable memory to all privileged to be present.

CLINICAL COMMUNICATION

ORAL TERRAMYCIN IN THE TREATMENT AND PREVENTION OF WHITE SCOUR IN CALVES

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A supply of crystalline terramycin hydrochloride was obtained for the treatment of white scour in young calves in the autumn of 1953. The terramycin was in oral tablet form, each tablet weighing 1 gramme.

Besides an attempt to treat the calves, six badly affected farms were selected with a view to preventing the disease developing in freshly dropped calves by means of oral therapy.

The results in the prevention and treatment of the disease in 62 calves were so spectacular as to merit a preliminary note on this use of terramycin.

Kafka (1951) has already claimed success in the prevention and treatment of white scour infections and a number of American workers claim that the organism said to be responsible, *Bacillus coli*, is highly susceptible *in vitro* to terramycin salts. Smith (1954) tested 58 strains of *B. coli* and found all sensitive *in vitro* to 1 to 8 μg. per ml. Comparative tests with other drugs showed chloramphenicol to be slightly less efficient and aureomycin and streptomycin next in line in effectiveness.

Treatment of Cases

Forty-one cases were treated, all being 3 to 10 days old when given terramycin. Serological and chemo-therapeutic substances had already been given to a number of cases prior to terramycin treatment, and in those recorded no response or only partial response had been shown.

The 1-gramme tablets were divided and each calf was given 0·5 gramme orally and a similar dose of 0·5 gramme in 24 hours.

Only one calf did not respond fully to treatment and this calf had been sick and scouring for four days previously. It was in very poor condition at the time of terramycin treatment.

The usual finding following treatment was a complete absence of diarrhoea inside 12 to 24 hours and an uneventful recovery following the administration of the second half tablet.

Rectal swabs were taken from a number of cases after treatment but *B. coli* infections were isolated from nearly all cases in spite of the clinical response shown.

Control groups of calves were easily kept owing to the shortage of terramycin material, as other treatments were essential. On one particular farm four cases were seen at the first visit. Terramycin was given to one calf and usual empirical treatments to the other three. The three latter recovered in about three days while the first calf recovered in 24 hours. This quick response to treatment was typical of all cases given terramycin, the scouring symptoms disappearing overnight and complete recovery being shown within a maximum of 36 hours.

Prevention

Twenty-one calves on six heavily infected farms were given 0·5 gramme orally within the first 24 hours after birth. A similar dose was given after a further 12 to 24 hours, and no other precautions were taken. The results were quite spectacular; not one case of white scour developed in any of the calves. Untreated control calves were again easy to keep on farms, and cases developed in these in the proportions usual to each farm—in two farms to the extent of 100 per cent.

No other means of prevention was used in the control calves, or coupled with the terramycin in the group under preventive treatment.

Discussion and Summary

An oral form of terramycin hydrochloride was used in an attempt to control white scour infections in young calves. Forty-one clinical cases were given two doses of 0·5 gramme each, and 40 of these (97 per cent.) recovered completely within 36 hours of treatment starting. The doses given were more than double those used by Kafka (1951), but coliform infections were not eliminated in spite of clinical response.

In the prevention of the disease in 21 calves on six infected farms, two doses of 0·5 gramme each were given within the first 36 to 48 hours of life. The results in prevention were 100 per cent. effective.

Acknowledgments.—The writer gratefully acknowledges the help given by all practising veterinary surgeons who presented cases for clinical treatment, and calves on infected farms for preventive treatment. Thanks are due also to Messrs. Pfizer, Ltd., for their generous supplies of terramycin.

References

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INTER-AFRICAN BUREAU FOR EPIZOOTIC DISEASES

The third Annual Session of this C.C.T.A. organisation took place at Muguga near Nairobi, Kenya, from July 28th to 30th, 1954, under the chairmanship of M. Larrat, Inspecteur-Général, Veterinary Services in Overseas France.

The representatives of the U.K. were Messrs. R. J. Simmons, C.M.G., C.B.E., of the Colonial Office, R. S. Marshall, C.B.E., Inspector-General of Animal Health, Nigeria, and H. R. Binns, O.B.E., Director, East African Veterinary Research Organisation. Delegates were present representing other C.C.T.A. territories, including Belgium, Federation of Rhodesias and Nyasaland, France, Portugal, and the Union of South Africa. All the delegates were veterinarians.

The work of the Bureau in the preceding 12 months was discussed and further recommendations were made for strengthening the information, liaison and administrative functions of the organisation which concerns itself with no less than 25 of the common diseases of domestic animals in Africa.

The *Bulletin of Epizootic Diseases of Africa* is compiled and edited by the Bureau and published in both French and English. It contains original articles on animal diseases in Africa, extracts and reviews of departmental annual reports, and abstracts from hundreds of scientific periodicals of special interest to veterinarians in Africa.

The inaugural meeting of the Inter-African Advisory Committee on Epizootic Diseases took place at the same time. This Committee was established by the member Governments of the C.C.T.A. to advise these Governments on the control of, and research into, epizootic diseases in Africa.

The Committee considered a report on the recent outbreak of Rinderpest in buffaloes and other wild animals in the region north of the Equator along the common boundaries of the Belgian Congo, Sudan and Uganda. The subject of Rabies was considered at length and it was recommended that a C.C.T.A./WHO training course on laboratory techniques and field control be held in Africa in 1955. Several of the new diseases which have been established or are in danger of being introduced into Africa were considered. Special consideration will be given at the next meeting of the Committee to the questions of sero-diagnosis in Contagious Bovine Pleuro-pneumonia, Vaccination in Foot-and-Mouth Disease in Africa, and Bovine Cutaneous Streptothricosis.

TORQUAY

With the near approach of Congress, readers of the *Record* may be interested to read something of the historic town, renowned for its climate and for its many amenities, in which the Western Counties Division will be acting as hosts to their colleagues from all parts of Britain.

The history of Torquay, or more correctly the site upon which it stands, dates back to the Ice Age. The ancient inhabitants had their abode in Kents Cavern overlooking the Ilsham Valley where fellow "guests" included the sabre-toothed tiger, the woolly rhinoceros and the great cave bear. Nowadays, Kents Cavern is a local show piece, considered as one of the most interesting caves in Europe and with a wealth of beautiful stalactite and stalagmite formations. The village of Cockington, forming a part of the borough, is mentioned in Domesday Book as the Manor of Cockintone. A little later Torre Abbey, where most Congress meetings will be held, was founded—actually in the 12th century—by the Premonstratensian Monastic Order. It is another show piece on the central sea front, its interest lying in the 12th century monastic ruins, the Corporation Art Gallery in the Mansion House, the large Floral and Palm House and the fine gardens which surround the buildings.

As a modern resort Torquay dates from the early part of the 19th century and owes its inception as such to the influence of the Royal Navy. During the Napoleonic Wars ships of the fleet used Torbay as a safe anchorage and the wives and families of the officers occupied houses around the seven hills of Torquay. Connection with the other two services is exemplified by the inclusion of the late General Viscount Plumer in the roll of Freemen of the Borough and by the selection, during the last war, of Torquay as a centre for initial Training Wings of the Royal Air Force.

Torquay is recognised in these days as one of the most beautiful among English seaside resorts. The softness of the climate gives it an enviable all-the-year-round season, and is exemplified by the wealth of palm trees and other subtropical trees and plants which bloom profusely out of doors.

Within the borough boundaries are such contrasting features as Babbacombe and St. Marychurch on the one side, which virtually constitutes "a resort within a resort" complete with its own beaches, entertainments, shopping centre and hotels, and the charming rural village of Cockington on the other. Eleven miles of coastline contain seven principal beaches, besides smaller beaches and coves, and public gardens, parks, and open spaces extend to over 1,000 acres.

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It is hoped that members intending to be present at the Congress who have not yet applied for tickets and badges will do so without delay.

Because of parking difficulties there, those wishing to take part in the visit to Dartington Hall are asked particularly to travel by the buses which will be provided and not by private car.

DARTINGTON HALL

As readers will have noted already in the Congress programme, one of the particular attractions this year is to be the conducted tour of the cattle breeding centre, farms, etc., at Dartington Hall. The following notes give an indication of the scope and history of this unique centre, the visit to which should certainly not be missed. The programme makes it clear also that an important paper "Present Position with Regard to Bovine Mastitis and a Review of Recent Trials of Various Antibiotics for Bovine Mastitis" by Mr. C. D. Wilson will be read during the visit.

Dartington Hall is a trust established in perpetuity by Mr. and Mrs. Elmhirst and administered at the present time by six Trustees. In order to carry out the purposes of the Trust in education and research a number of endowed departments were set up, and the commercial enterprises formed into two companies, Dartington Hall, Ltd., and Dartington Woodlands, Ltd.

The area of land owned by the Trustees is approximately 3,000 acres, and over 400 people are employed by the companies and other departments.

Dartington Hall, Ltd., is the company which manages the following agricultural and commercial enterprises on the estate :—

The farms specialise in dairy farming. The Barton and Old Parsonage Farms include about 700 acres of land, and are stocked with Ayrshire and South Devon cattle respectively. Yelland Farm, a few miles away, specialises in the production of pigs, and also has a small herd of Friesian cattle. Pigs are bred both at Yelland and the Old Parsonage Farms to be reared for sale as baconers. Marley Farm, near Yelland, is a mixed farm with some emphasis on fruit growing.

The Company also markets horticultural products, both from its own gardens and from other local growers.

The Sawmill gets its raw materials both from the estate and an extensive area of Devon and Cornwall. This mill is a large supplier to a variety of markets. It includes small wood-turning and gate-making sections.

The Textile Mill manufactures woollens, tweeds and furnishing fabrics. Administration and sales are centred at the Dartington mill, where the weaving and finishing is done. Dyeing, blending and spinning take place at the Company's mill at Fordingbridge, in Hampshire.

Dartington Woodlands, Ltd., is the company which has been set up to manage the Trustees' 2,000 acres of woodlands on a commercial basis. The woods are scattered, on the estate above the Dart, at Buckfastleigh and in the valley of the Teign near Moretonhampstead. The Company aims at cutting and replanting in balanced rotation so as to maintain a sustained yield.

The first mention of Dartington occurs in the registers of Shaftesbury Abbey under the date A.D. 833 when Lady Beorgwyn exchanged certain lands in Dorset for this estate in Devon. Of the pre-Saxon age there is no written history, though the presence of earthworks in North Wood may be evidence of a Celtic attempt to foil attacks across the River Dart at Staverton ford.

At the Conquest the Manor of Dartington surrendered to William de Falaise, and by 1113 came into the ownership of Robert Fitz-Martin. After eight generations the estate went to James, Lord Audeley in 1348. For want of an heir Dartington passed into the hands of the Crown, and in 1388 the estate was included in a gift of lands in Devon and Cornwall made by Richard II to his half-brother John Holland when he created him Earl of Huntingdon. The Banqueting Hall and Courtyard were built by John Holland at the end of the 14th century. The present Elizabethan house behind the Hall was erected on the foundations of the 14th century cloister.

In the reign of Henry VIII Sir Arthur Champernowne took the estate in part exchange for the house and demesne of Polsloe Priory near Exeter, and it remained in the possession of the Champernowne family for over 300 years until agricultural depression and other causes brought about its sale in 1925 to Mr. and Mrs. Elmhirst.

REVIEWS

[Animal Forms and Patterns. By Adolf Portmann. Faber. Price 25s.]

"Animal Forms and Patterns" by Professor Portmann is a fascinating study of the varieties of animal colouring and structure in association with their life and habits. The book goes into very great detail to explain the reasons and reasoning behind these details.

I think most veterinary surgeons will find many things of interest, but I confess that the bulk of the book is somewhat tedious to read. Perhaps this is because one may think that some of the text is much ado about nothing and over verbose, and on the other hand that the translation from the German, skilfully done by Hella Czech, is too ponderous and obviously done very literally. As to the style of the book, I think it could have been printed on better paper and some of the illustrations might better have been done by photographs which would have been far more dramatic, particularly if some of them could have been done in colour. When one realises that the book costs 25s., it is surely not too much to expect rather better layout.

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["Wild Brother." By Mary Patchett. Collins. Price 10s. 6d.].

This is a fascinating tale of three dogs, two of them wild dingoes, the third a "kangaroo" dog. The text is robust and dramatic, travelling easily from chapter to chapter without any break in interest. The dramatisation of any animal's life if skilfully carried out will always have an immediate appeal to many people and Miss Patchett is to be congratulated on tackling two wild dogs in the same vein and succeeding in incorporating her reader into the tale. "Wild Brother" is a book that those of all ages will enjoy.

Personally I have an aversion to dialects being put into print, since there are so many pitfalls into which the inexperienced author can fall, including over-emphasis and exaggeration of accent. I would have thought an Australian accent the most difficult to imitate in print, but somehow Miss Patchett manages to get away with it for the most part of the time. She certainly paints a vivid picture of the Australian outback, with the rigours of the life for the men who work in the area. I feel that Miss Patchett could have left out some of her injections of zoology, which seem strangely out of place at times: I doubt if the experienced reader of animal books of this type would be so very interested in discussions on Monotremes as a whole when the descriptions of members of that order are so adequately done in the book without scientific reference.

"Wild Brother" is a book to be read, re-read, and read again, and at half a guinea is very good value indeed.

NOTES AND NEWS

Diary of Events

Sept. 14th.—Combined Summer Meeting of the East Midlands and South-East Midlands Divisions, B.V.A., at the Veterinary Science Division Laboratories, Boots Pure Drug Co., The Priory, Thurgarton, 1.15 p.m.

Sept. 19th—25th.—72nd Annual General Meeting and Congress of the British Veterinary Association at Torquay.

Sept. 30th.—Meeting of the Essex Veterinary Society at the Essex Institute of Agriculture, Writtle, 7.30 p.m.

Nov. 16th & 17th.—B.V.A. Conference on the Feeding of Farm Livestock for Health and Production in the South Hall, Victoria Halls, Bloomsbury Square, London, W.C.1.

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PERSONAL

Births.—Brown.—To May, wife of A. C. L. Brown, M.R.C.V.S., at Somerleigh Court, Dorchester, Dorset—a sister for Lindsay.

Cormack.—On August 6th, 1954, to Heather, wife of James G. Cormack, M.R.C.V.S., 296 Queens Road, Aberdeen, a son—Scott Roger.

Price.—On August 25th, 1954, at Palmerston North, to Patricia, wife of Michael C. Price, M.R.C.V.S., of Rougotea, New Zealand, a daughter—Janet Diana.

Scott.—On July 18th, 1954, at Princess Elizabeth Hospital, Nairobi, Kenya, to Joan, wife of Gordon R. Scott, M.SC., M.R.C.V.S., a son.

Watson.—On August 5th, 1954, to Dr. Barbara Watson (née Leach), wife of David A. Watson, B.A., M.R.C.V.S., of 18 Denmark Road, Gloucester, a son—brother to Sally Ann.

. . . . .

Engagement.—Palmer-Charman.—The engagement is announced between Rex Hugh Faithful, B.SC., M.R.C.V.S., only son of Mr. Rex Palmer, of London, and Mrs. Dorothy Palmer, of Hove, and Shirley, younger daughter of Mr. and Mrs., A. E. Charman, Half Moon Riding Stables, Storrington, Sussex.

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Marriage.—Croft—Timms.—At St. Mark's Church, Leamington Spa, on September 4th, 1954, David Charles Croft, B.V.SC., M.R.C.V.S., elder son of Mr. and Mrs. C. R. Croft, of Bullimore Lodge, Kenilworth, to Pauline Timms, daughter of Mr. and Mrs. E. J. Timms, of 53, Greville Road, Warwick.

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CONGRESS PAPERS

Owing to the number of Congress Papers this year, and the consequent pressure upon our printers, delivery to members of the Association has to be made in successive weeks. All Papers should be received immediately after this week-end, and should anyone not have received by then a full complement, a letter addressed to Headquarters will have immediate attention.

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VISIT OF DIRECTOR-GENERAL OF F.A.O.

Dr. P. V. Cardon, Director-General of the Food and Agriculture Organisation of the United Nations is on a visit to this country. He has met the Minister of Agriculture, the Joint Parliamentary Secretary, and others, and has addressed the annual meeting of the British Association at Oxford. During his stay in Britain, he will be seeing something of British farming and of the activities of the National Agricultural Advisory Service. He returns to Rome on September 10.

Dr. Cardon was elected Director-General of F.A.O. at the end of 1953 and took up his duties in February of this year. He entered the service of the U.S. Department of Agriculture in 1909 and has since held a variety of field and administrative posts in that Department and elsewhere. His administrative experience has been considerable, ranging from early superintendence of an experimental farm up to his position as Research Administrator to the U.S. Department of Agriculture which he held from 1945 until his retirement in 1952.

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AGRICULTURAL RESEARCH

In a recent paper entitled "Agriculture, The Industry and the Science," Dr. R. E. Slade advocated a freer exchange of staff between the Agricultural Research Council's institutes, the experimental farms of the Agricultural Improvement Council, and the county organisations of the Agricultural Advisory Service. Each of these organisations, Dr. Slade said, enjoyed excellent co-ordination within itself, but there seemed to him too little co-ordination of each with the other. There were men of high calibre available and they were doing valuable work. He believed such work would be enhanced by the kind of collaboration he had in mind.

ERRATA

We regret that in our issue of August 28th, the name Brooksbank, which appears in the letter from Mr. R. F. W. Goodwin, was incorrectly spelt Brookshank. In the same issue the Herts. and Beds. Veterinary Society was wrongly referred to as the Hunts. and Beds. Society.

. . . .

We should like to correct the form of the foot-notes which were attached on page 507 in our issue of September 4th to the article by Dr. A. D. McEwen.

The notes should have read:—

* Sera from Groups 1, 3, 5, and 7 tested at the same time against the same sample of virus.

† Sera from Groups 2, 4, 6, and 8 tested at the same time against the same sample of virus.

‡ Sera from Groups 1, 2, 5, 6, and 7 tested at the same time against the same sample of virus.

Comparison should be made between sera tested at the same time.

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"THE INCISOR"

We have recently received a copy of this excellently produced journal, the magazine of the Royal Veterinary College. It is well printed and illustrated, contains a wide variety of subject matter and some good amateur sketches. In a leading article the Editor reflects upon some of the many woes inseparable from his office (we are all too familiar with them), but seems to deplore an increase in his advertising revenue, a detachment of mind unique in the annals of journalism!

The various social and sports clubs within the College contribute an interesting quota to the contents of the journal, as do the poets, whose muse, unlike that of their more established brethren, enjoys at least the advantage of being comprehensible. If we may offer a suggestion the appearance of the pages could be improved still further by setting the type a quarter of an inch narrower, and by using a darker face for the main headings. Before the Editor writes to us about beams and motes may we mention that the next issue of the *Record* will appear in a new format.

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SUMMER MASTITIS

According to one of the principal western daily newspapers an epidemic of summer mastitis in North Dorset and South Wiltshire may be passing its peak. Tribute is paid to local members of the profession who have been "working day and night" among the affected herds.

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MYXOMATOSIS

The disease, which first appeared among wild rabbits in Kent last October, has now appeared in 38 counties in England, in all the 13 Welsh counties and in 10 counties in Scotland. Some practitioners have advised the *Record* that clients are inquiring whether myxomatosis is transmissible to pet animals. So far there is no evidence that this is so, but tests are continuing.

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THE AGRICULTURE (POISONOUS SUBSTANCES) REGULATIONS, 1953

The appeals of an agricultural spraying contractor against convictions by the Huntingdon County Justices for contravention of the Agriculture (Poisonous Substances) Regulations have been dismissed.

The Chairman of the Appeals Committee of the Quarter Sessions in giving the Court's decision said that the offences were of considerable gravity and that it was very proper that the Ministry of Agriculture and Fisheries should have taken proceedings against the contractor. As however the prosecution was the first under these Regulations he felt that some slight reduction could be made in the amount of the fines. These were accordingly reduced from a total of £75 to £55 as follows:—

For having no register: fine £5, reduced from £10; for not supplying all the protective clothing required under the Regulations, fine £20, reduced from £25; for permitting a worker to carry out spraying when not wearing protective clothing, fine £30, reduced from £40.

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ADDRESSES OF DISEASE-INFECTED PREMISES

The list given below indicates, first, the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

ANTHRAX:

Ches.—Bank Farm, Marbury, Whitchurch (Aug. 31).
Leics.—Mythe Farm, Sheepy, Atherstone (Sep. 2).

FOWL PEST:

Leics.—No. 30 Holding, Land Settlement Association, Elmesthorpe (Aug. 31); No. 32 and No. 42 Holdings, Elmesthorpe (Sep. 1).
Norfolk.—Cobholm Allotments, Great Yarmouth (Aug. 31).

SWINE FEVER:

Cambs.—Christchurch, Upwell, Wisbech (Sep. 1); Gravel End Farm, Coveney, nr. Ely (Sep. 2).
Essex.—Anchor House Farm, Abbess Roding, Ongar (Sep. 1).
Gloucs.—Hill Farm, Hasfield, Gloucester (Sep. 1).
Herts.—Broad Oak End Farm, Bramfield Road, Hertford (Sep. 3).
Kent.—Waldens Piggeries, St. Mary Cray, Sidcup (Sep. 3).
Lincs.—Dankers Farm, Newark Road, Thorpe-on-the-Hill, Lincoln (Sep. 3).
Norfolk.—Chapel Farm, Croxton, Thetford (Aug. 31).
Notts.—Mill House, Rampton, Retford (Sep. 1).
Salop.—Cockshutt House, Cockshutt, Ellesmere (Aug 31); "Yockleton Hall," Yockleton, Shrewsbury (Sep. 1).
Staffs.—Cox Green Farm, Enville, Stourbridge; Allotments, off Scott Lidgett Road, Longport, Stoke-on-Trent (Sep. 2).

CORRESPONDENCE

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the B.V.A.

SWINE FEVER CRYSTAL VIOLET VACCINE

Sir,—A considerable amount of adverse comment on this vaccine has been made in recent weeks, in the Farming Press and by pig breeders all over the country. This has resulted from reports of "break down" of immunity in some vaccinated herds. There is no doubt that considerable damage is being done to the reputation of what we believe to be a very reliable and satisfactory immunising agent. Moreover, veterinary surgeons in practice are having great difficulty in dealing with these disturbing assertions, because no reliable information about the true state of affairs has been published. We are quite sure that Crystal Violet Vaccine, as produced by the Ministry, is safe and efficient, and that if used according to directions in healthy pigs, will not, in fact cannot, cause any harm, but will give reasonably firm immunity against swine fever. We have evidence of its safety and efficiency in our own hands and have reports of equally good results from other practitioners using it in large numbers of pigs. We know of vaccinated herds in which an outbreak of swine fever has occurred, involving only un-immunised animals, whilst vaccinated in-contacts proved completely resistant.

It does seem that a great deal of misinformed criticism would have been stifled if some factual statement had been issued at the outset. Even now, a statement by the Ministry, involving no personalities or particular cases, would be in pursuance of their policy of encouraging vaccination against swine fever, and at the same time, give reassurance to pig keepers and practising veterinary surgeons.—Yours faithfully, E. P. BARRETT, J. NICOL, J. H. H. CRIPPS, 28, Stoke Road, Guildford. *September 4th*, 1954.